

UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 6,683,389 B2  
APPLICATION NO. : 09/938101  
DATED : January 27, 2004  
INVENTOR(S) : Geis

Page 1 of 12

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

The title page showing the illustrative figure should be deleted to be replaced with the attached title page.

Drawing sheets, consisting of figs. 1-10, should be deleted to be replaced with the drawing sheets, consisting of figs. 1-10, as shown on the attached page.

Signed and Sealed this

Fifth Day of February, 2008



JON W. DUDAS  
*Director of the United States Patent and Trademark Office*

(12) United States Patent  
Geis

(10) Patent No.: US 6,683,389 B2  
(45) Date of Patent: Jan. 27, 2004

(54) HYBRID ELECTRIC VEHICLE DC POWER GENERATION SYSTEM

(75) Inventor: Everett R. Geis, Orange, CA (US)

(73) Assignee: Capstone Turbine Corporation, Chatsworth, CA (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/938,101

(22) Filed: Aug. 23, 2001

(65) Prior Publication Data

US 2002/0070557 A1 Jun. 13, 2002

Related U.S. Application Data

(63) Continuation of application No. 09/609,099, filed on Jun. 30, 2000, now abandoned.

(51) Int. Cl' F02N 11/06

(52) U.S. Cl. 290/40 C; 180/65.2

(58) Field of Search 180/65.2; 322/16; 290/40 R

(56) References Cited

U.S. PATENT DOCUMENTS

5,568,023 A \* 10/1996 Orsler et al. 180/165  
5,698,905 A \* 12/1997 Ruthlein et al. 180/65.4

5,806,617 A	*	9/1998	Yamaguchi .....	180/65.2
5,848,659 A	*	12/1998	Kang et al. ....	180/65.2
5,924,505 A	*	7/1999	Theurillat et al. ....	180/65.4
5,965,991 A	*	10/1999	Koike et al. ....	318/139
5,969,624 A	*	10/1999	Sakai et al. ....	180/65.2
6,137,250 A	*	10/2000	Hirano et al. ....	180/65.2
6,175,172 B1	*	1/2001	Bahholdin et al. ....	310/74
6,194,794 B1	*	2/2001	Lampe et al. ....	307/68
6,213,234 B1	*	4/2001	Rosen et al. ....	180/65.3
6,281,601 B1	*	8/2001	Edelman et al. ....	307/29
6,487,096 B1	*	11/2002	Gilbreth et al. ....	363/35

FOREIGN PATENT DOCUMENTS

JP 11098728 A \* 4/1999

\* cited by examiner

Primary Examiner—Nestor Ramirez

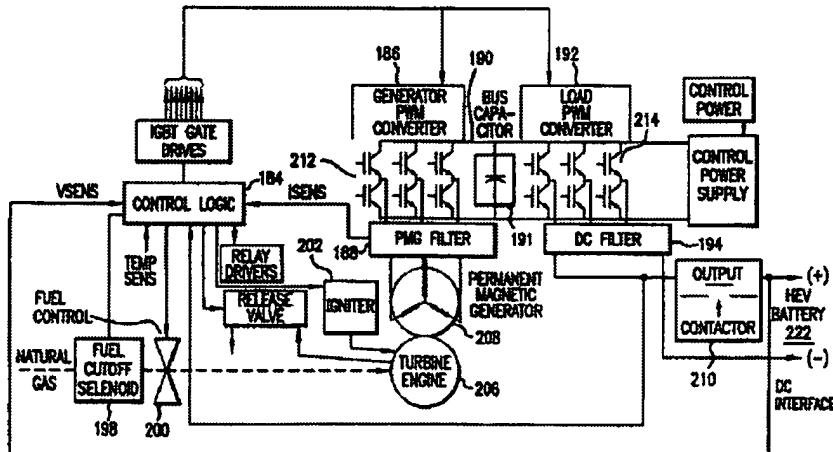
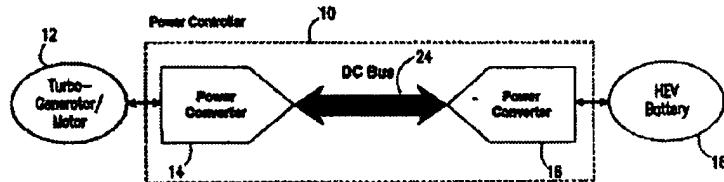
Assistant Examiner—Julio Cesar Gonzalez

(74) Attorney, Agent, or Firm—Sterne, Kessler, Goldstein & Fox P.L.L.C.

(57) ABSTRACT

A hybrid electric vehicle, such as a bus or delivery vehicle, includes batteries and a turbogenerator/motor connected through a double conversion control system. The batteries and the turbogenerator/motor are each connected to a DC bus through bi-directional power converters operating as customized bi-directional switching converters configured, under the control of a power controller, to provide an interface between the DC bus and the batteries and turbogenerator/motor, respectively.

7 Claims, 10 Drawing Sheets



U.S. Patent

Jan. 27, 2004

Sheet 1 of 10

6,683,389 B2

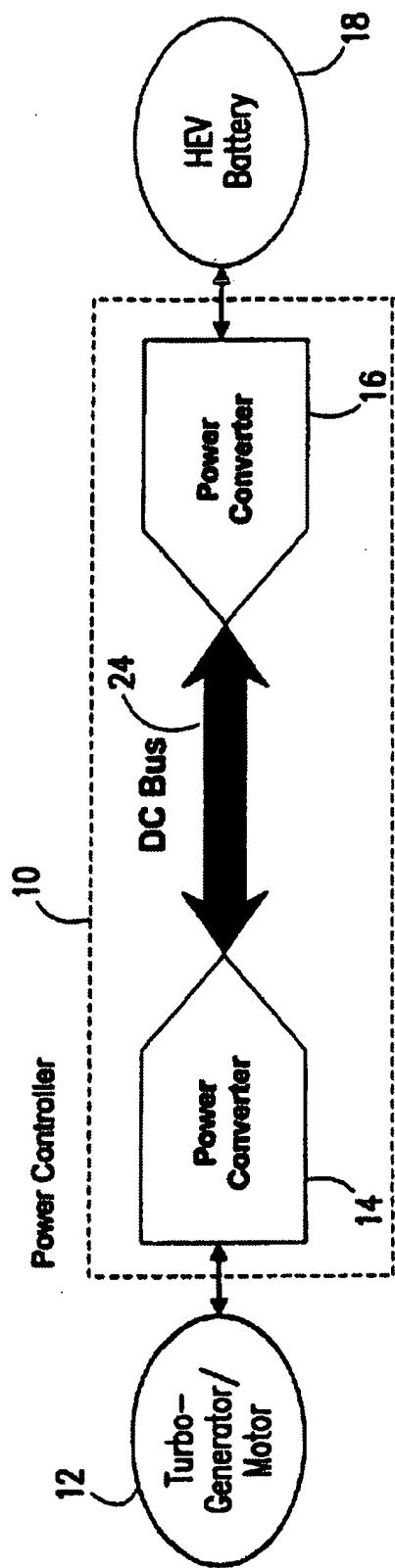


FIG. 1

U.S. Patent

Jan. 27, 2004

Sheet 2 of 10

6,683,389 B2

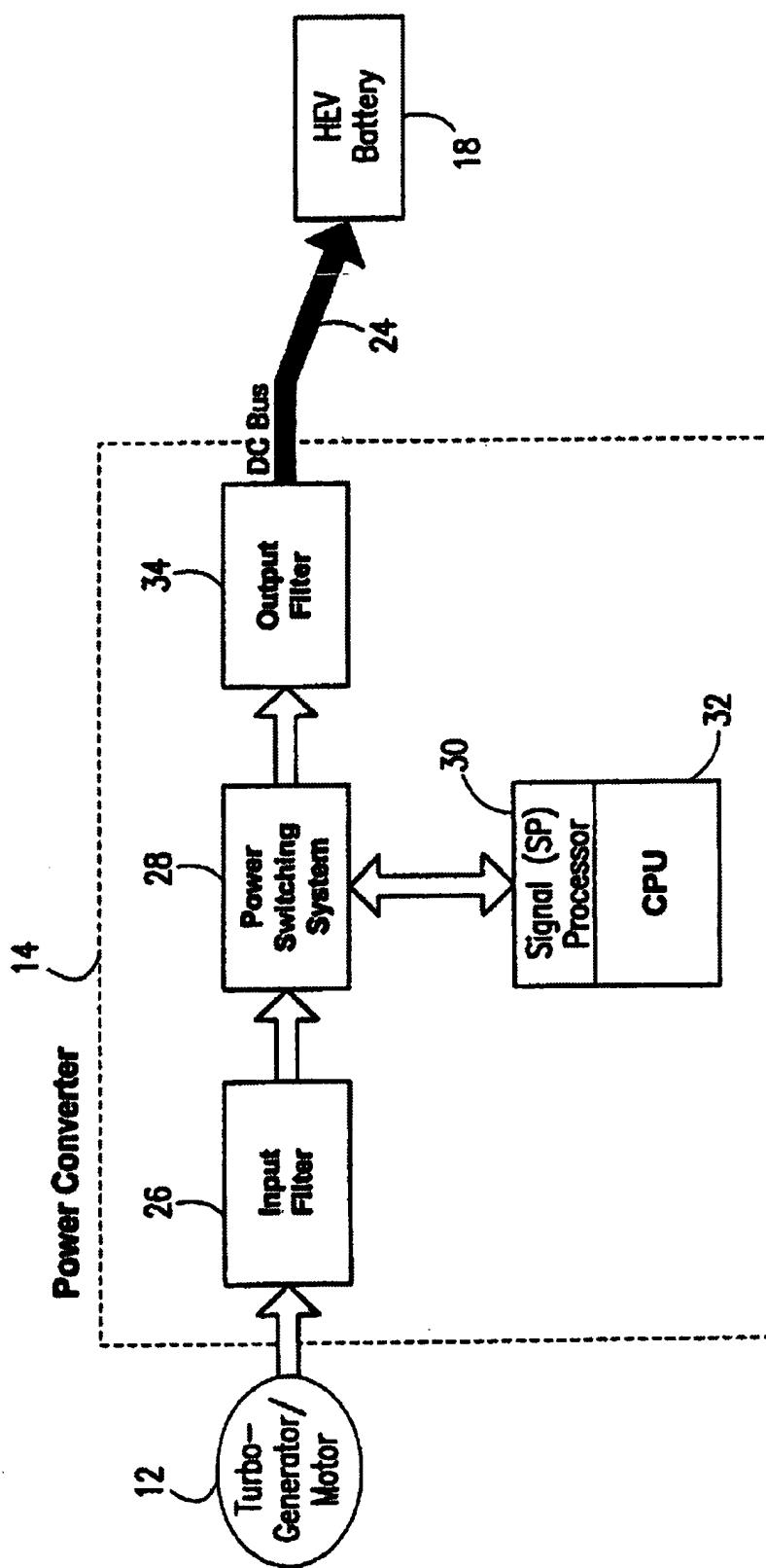


FIG. 2

U.S. Patent

Jan. 27, 2004

Sheet 3 of 10

6,683,389 B2

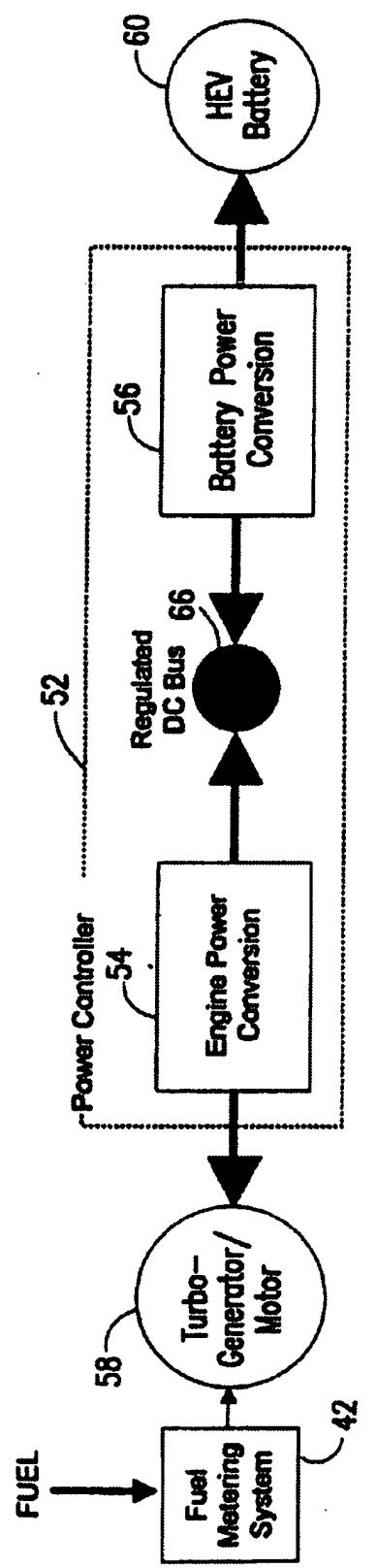


FIG.3

50

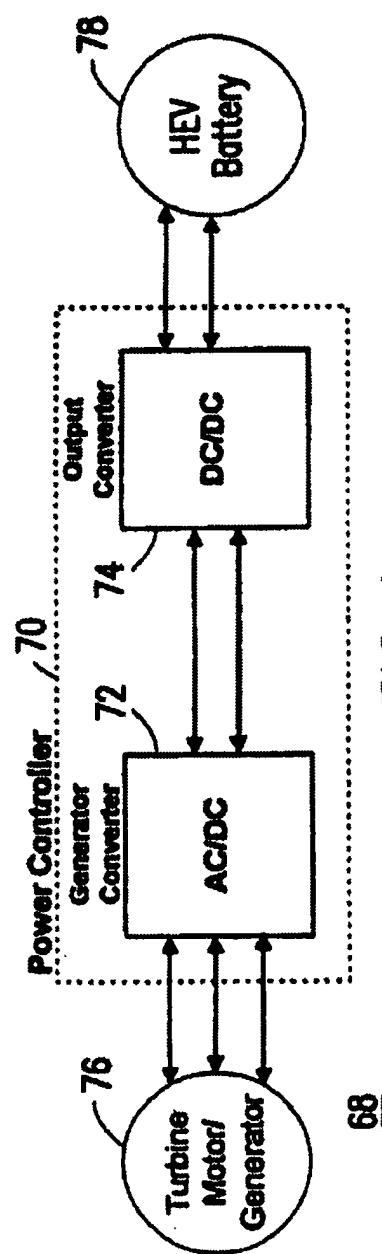


FIG. 4

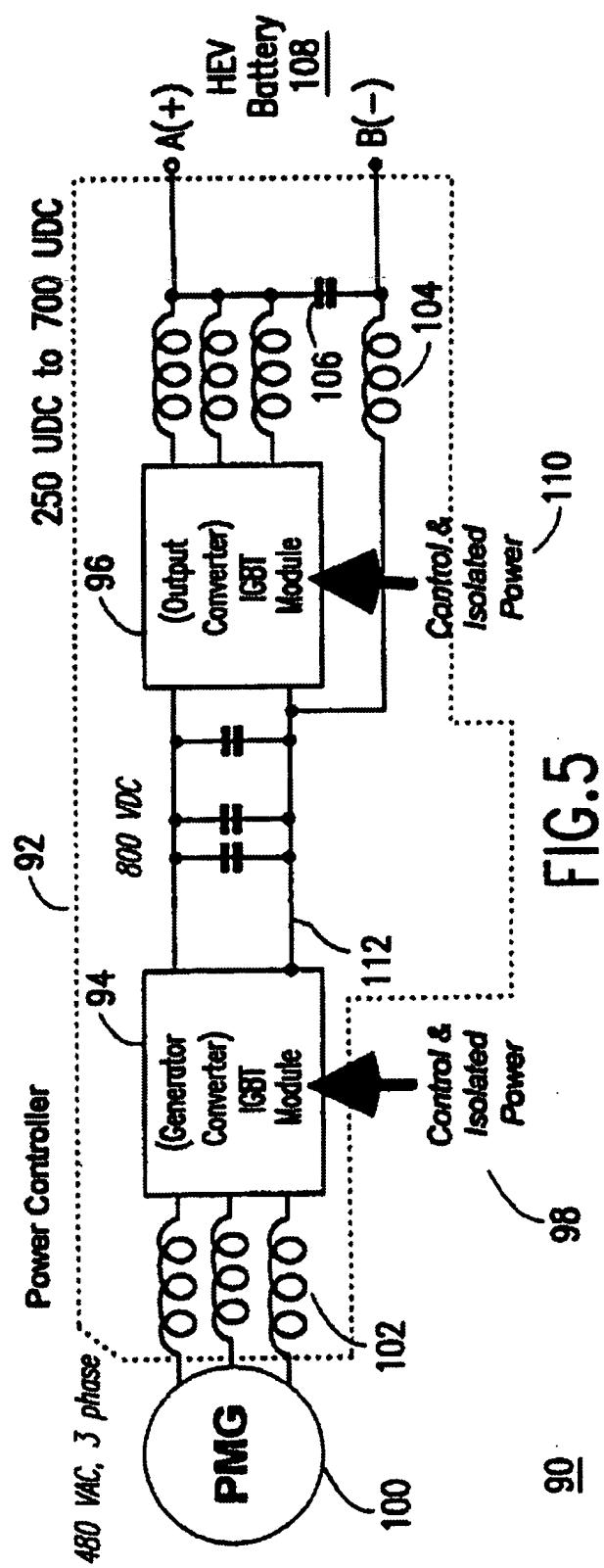


FIG. 5

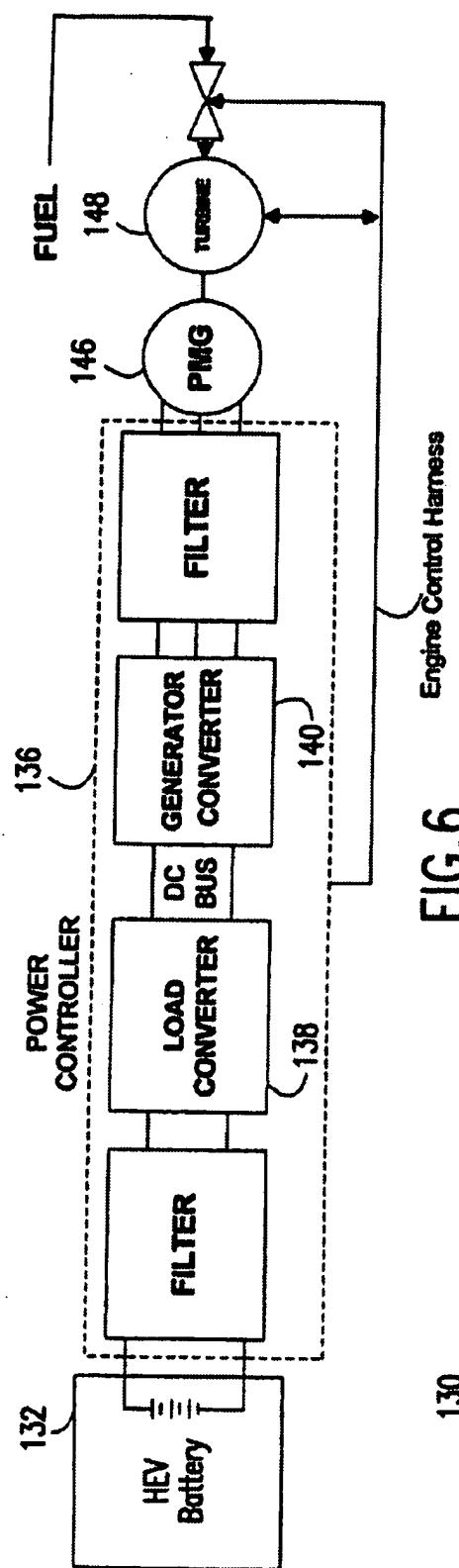


FIG. 6  
Engine Control Harness

130

U.S. Patent

Jan. 27, 2004

Sheet 6 of 10

6,683,389 B2

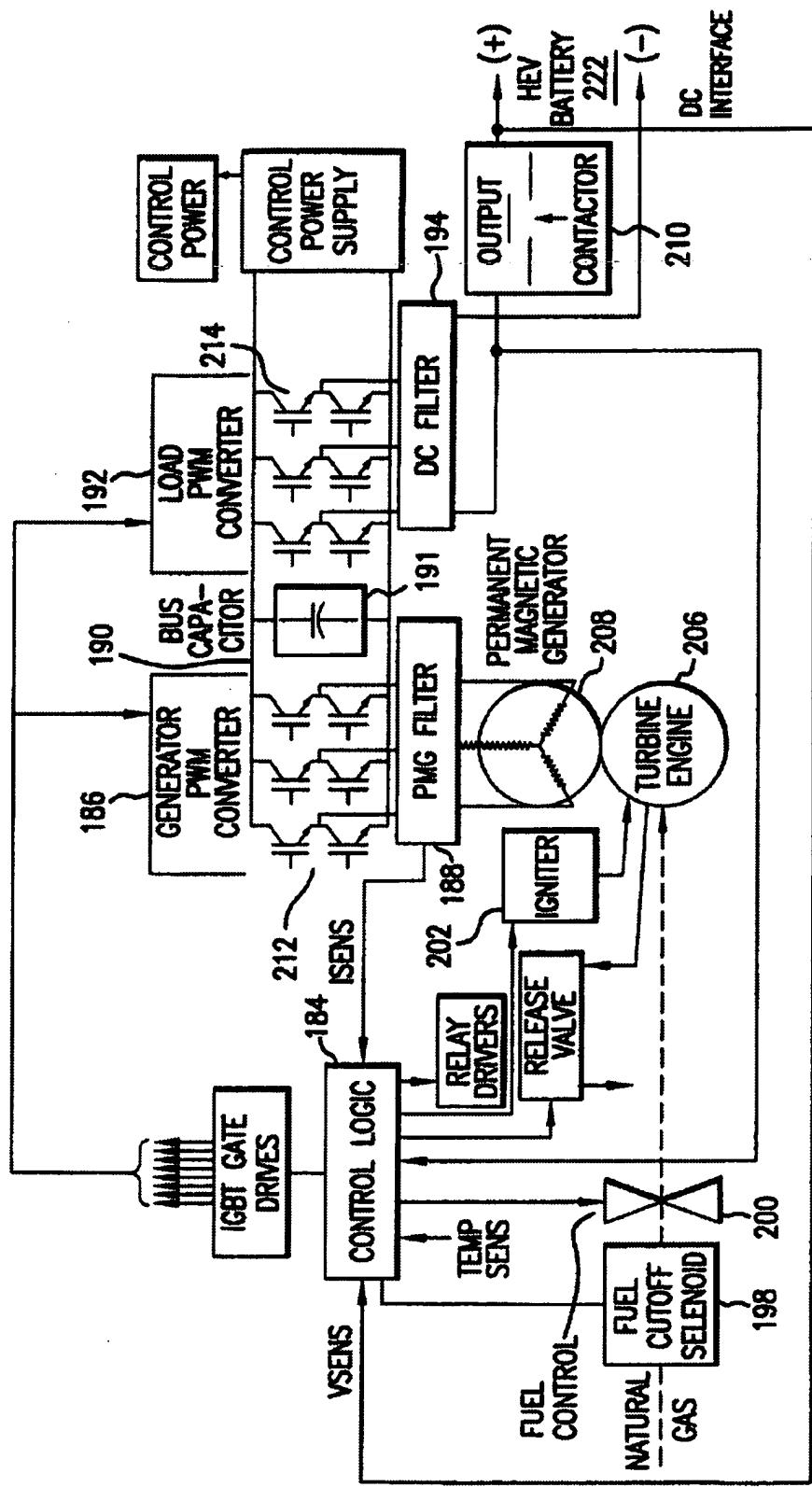
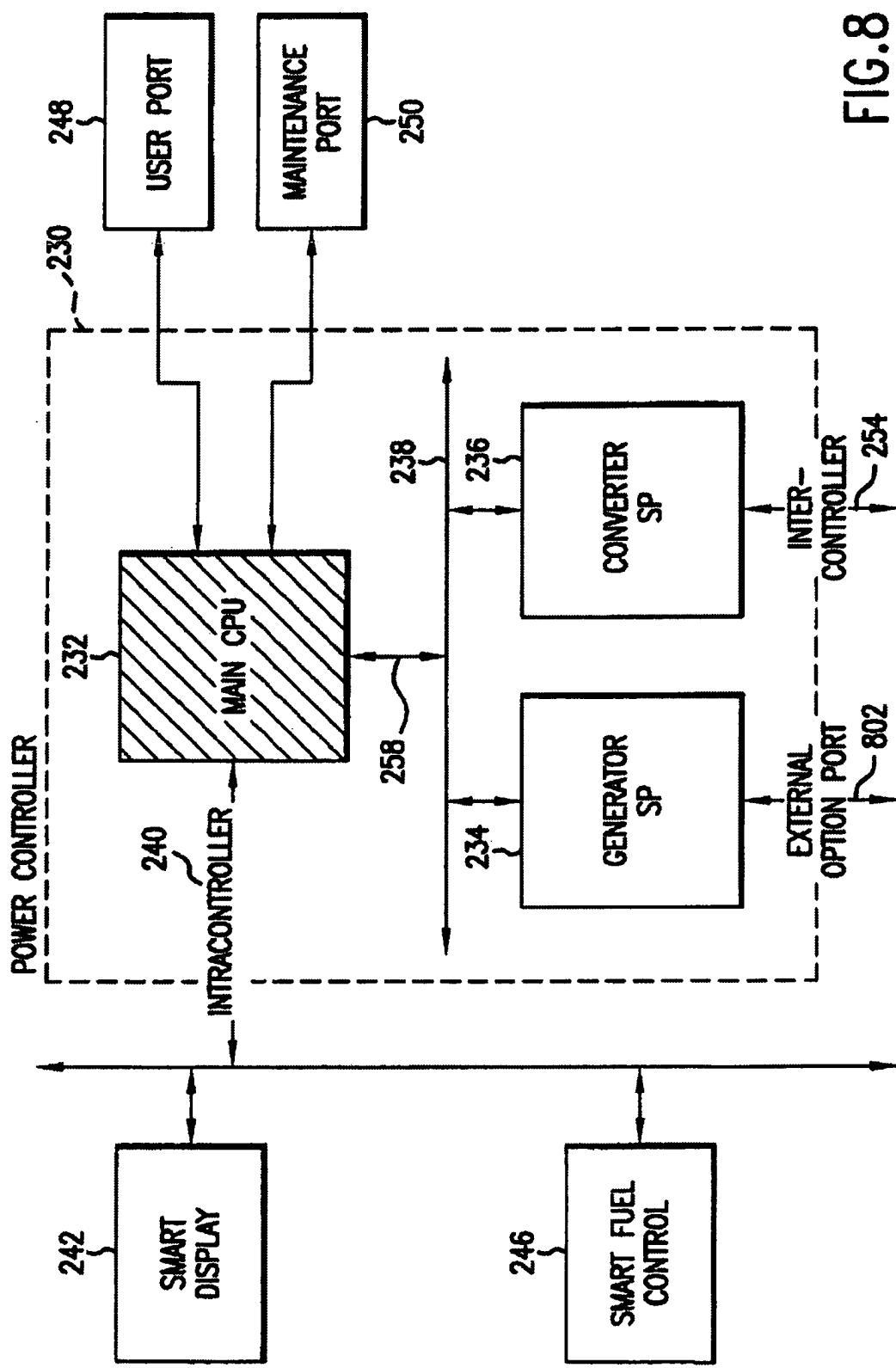


FIG. 7

180

FIG.8



U.S. Patent

Jan. 27, 2004

Sheet 8 of 10

6,683,389 B2

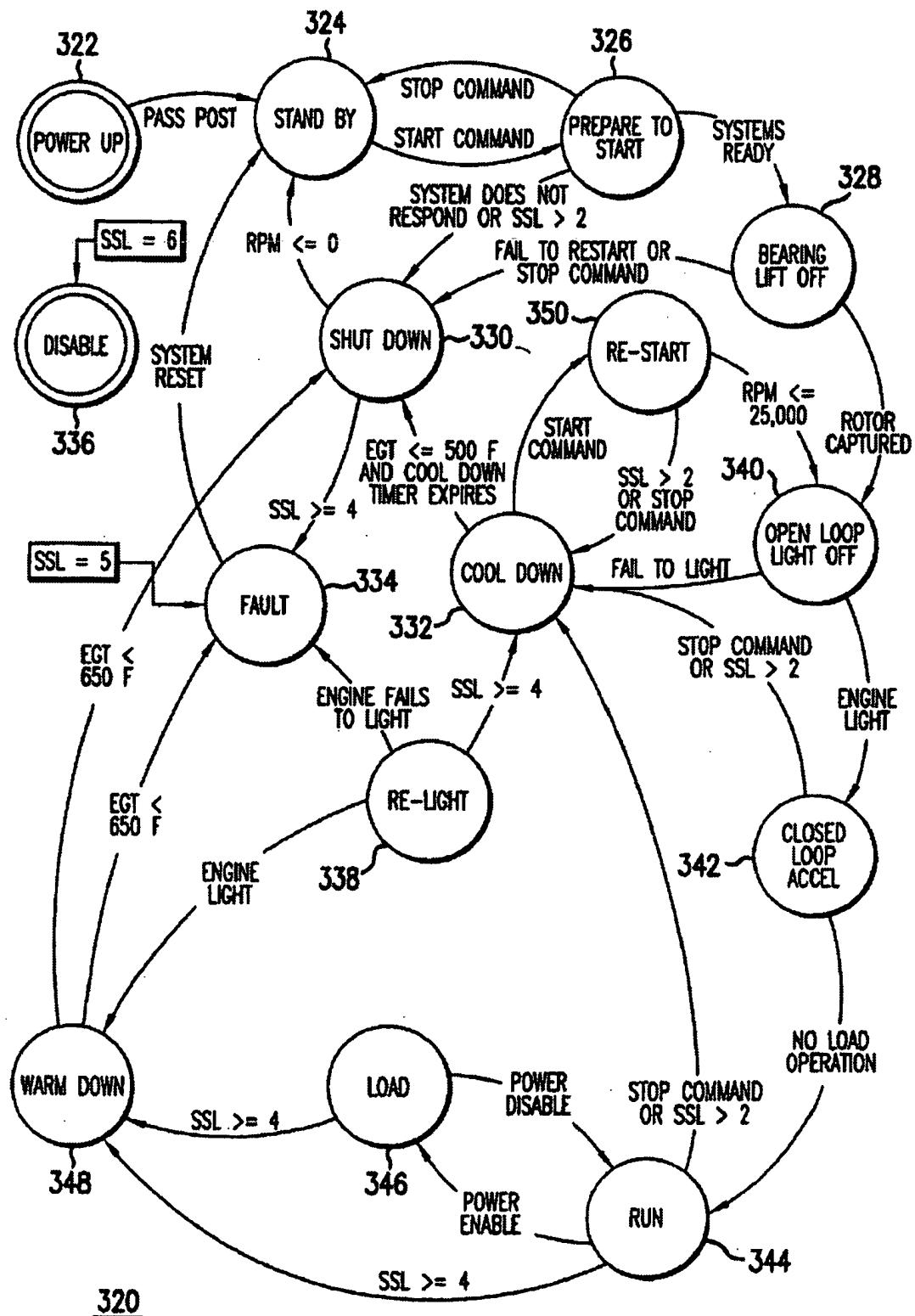


FIG.9

U.S. Patent

Jan. 27, 2004

Sheet 9 of 10

6,683,389 B2

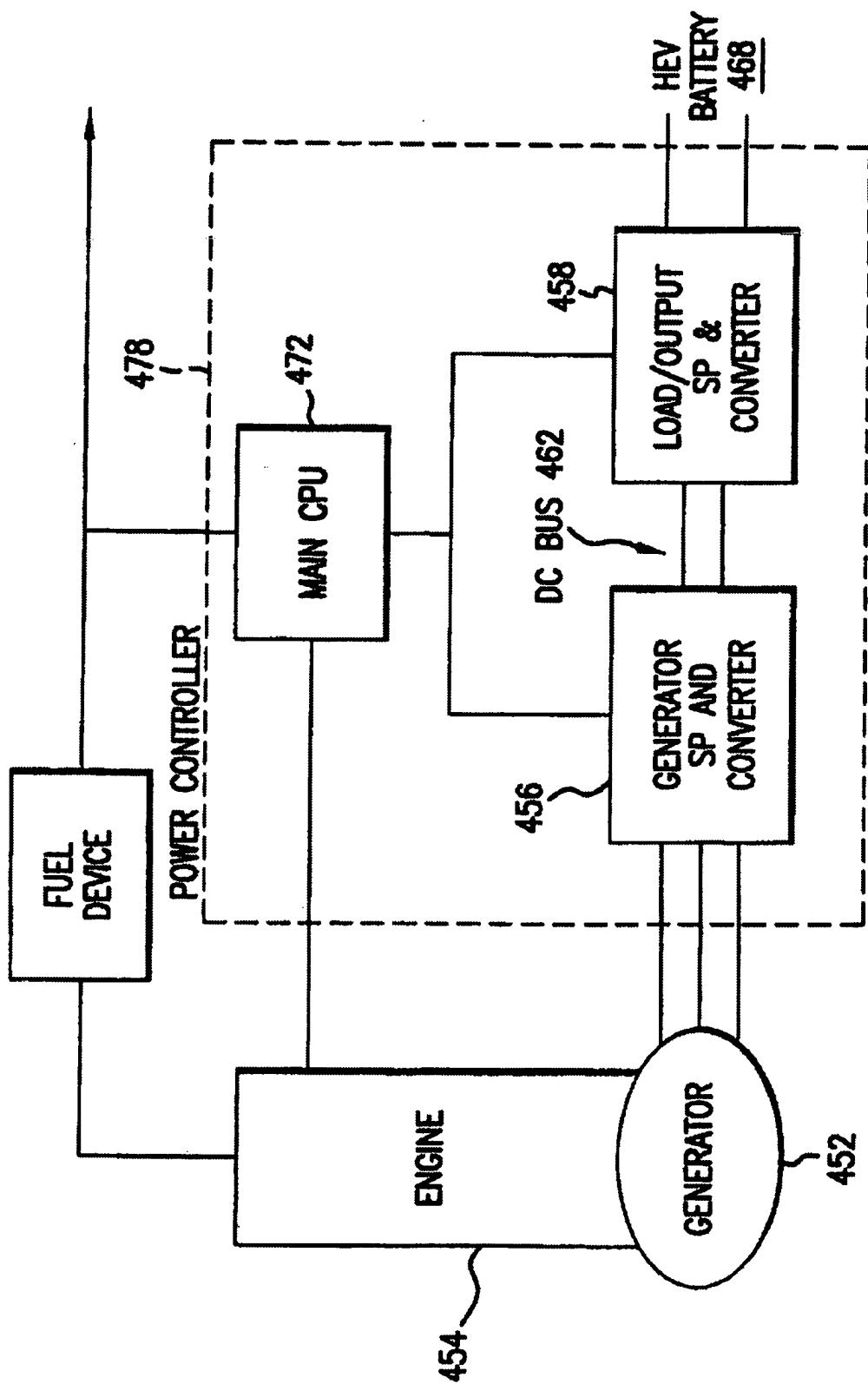


FIG. 10

U.S. Patent

Jan. 27, 2004

Sheet 10 of 10

6,683,389 B2

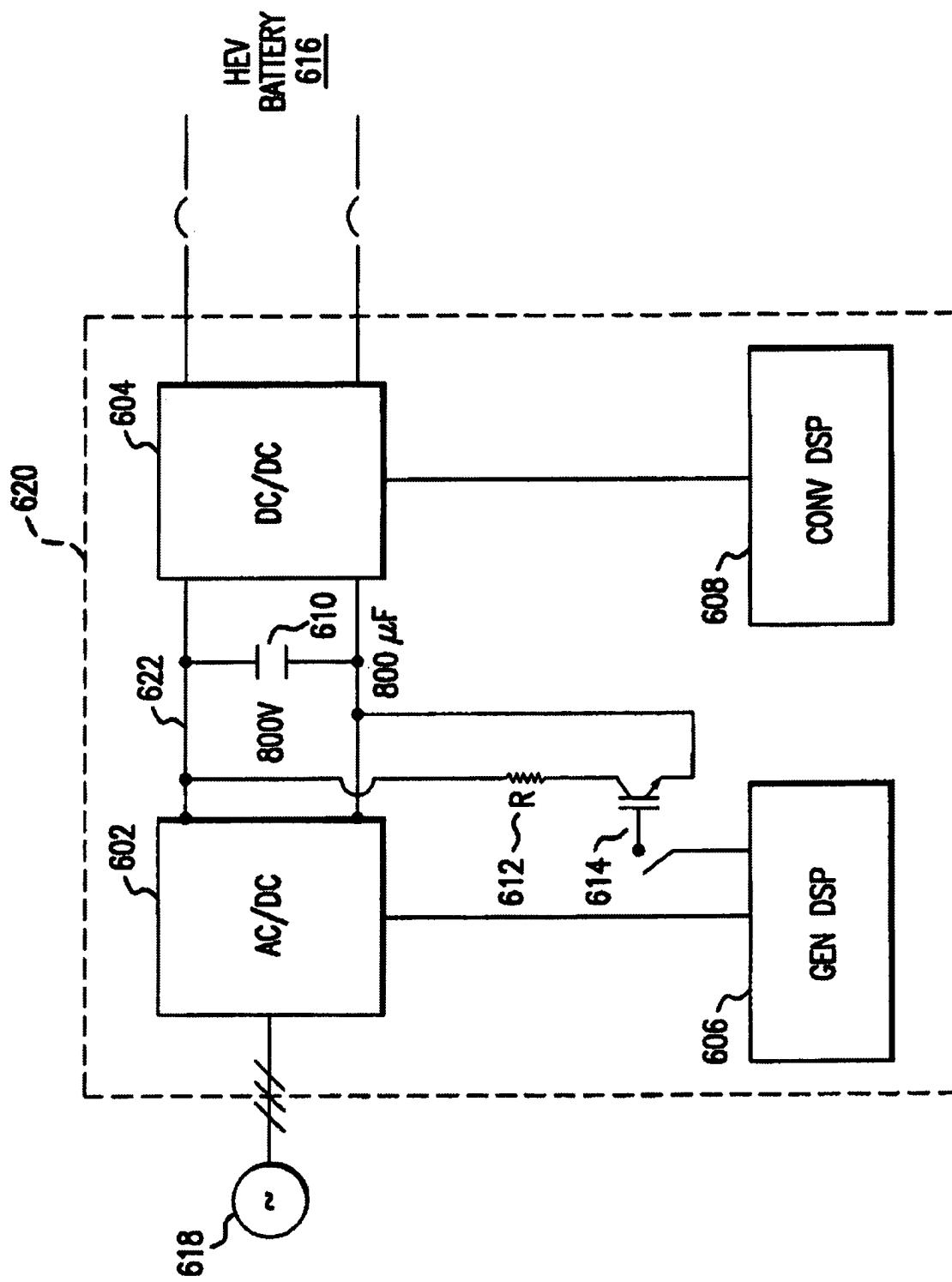


FIG. 11